4.3.5 Sex Chromosomes and Sex Linkage Questions

Each person normally has one pair of sex chromosomes in each cell. Females have two X chromosomes, while males have one X and one Y chromosome.

The X chromosome contains about 1000 genes, including the genes for haemophilia and colour blindness. For this reason these genes are said to be sex-linked.

a. Write a definition of *"sex-linkage"*.

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b. Name two examples of sex-linked genetic disorders. (hint – read the introduction again)

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- ……

c. Explain why human females can be homozygous or heterozygous for sex-linked genes, and why males cannot.

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What is the best notation to use for these alleles of genes found on the X-chromosome? We need to show the X chromosome or the y chromosome in the notation. The allele must also be shown and this can be recessive or dominant.

For these reasons alleles are usually written as X^N or X^n or y^-

(the $^-$ represents the absence of an allele on the y chromosome)

d. The allele for colour blindness (n) is recessive to the allele for normal vision (N). This gene is carried on the X chromosome. For this reason the notation of these alleles is X^n and X^N. Complete the table below to show the genotypes and phenotypes of individuals with regard to colour blindness.

	Female	**Male**
Normal	X^NX^N	
Affected		
Carrier		Not possible! Why?

e. In the space below, complete a punnet grid to show a cross between a normal male and a carrier female. What is the expected ratio of F1 phenotypes?

1. Haemophilia is a blood-clotting disorder that is also recessive and sex-linked. The alleles are usually written as X^H = normal clotting allele and X^h = haemophilia allele

a. State the normal function of the gene associated with haemophilia.

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b. Describe the effects and symptoms of haemophilia.

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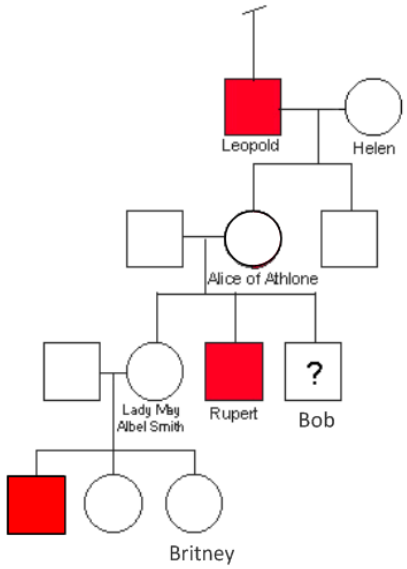
c. Use the pedigree chart to deduce the possible genotype(s) of the named individuals.



Leopold
Helen
Alice
Mary
Rubert
Bob
Britney